

O'CONNOR

REPORT

on

A PLAN FOR RAPID TRANSIT IN SAN FRANCISCO
CONSONANT WITH THE BAY AREA RAPID TRANSIT SYSTEM

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May 1960

Prepared by the

Transportation Technical Committee

S.F. Mayor's Transportation Council.

THE TRANSPORTATION TECHNICAL COMMITTEE
OF THE MAYOR'S TRANSPORTATION COUNCIL

J. R. McCARTHY, Director of Planning, Chairman
R. H. OWENS, Director of Public Works
C. D. MILLER, Gen. Mgr. Municipal Railway
H. E. LLOYD, Chief Engin. Utilities Engin. Bureau
V. T. FISHER, Gen. Mgr. Parking Authority

May 19, 1960

100 Larkin St., San Francisco 2, Calif.

Honorable George Christopher, Mayor
Honorable Board of Supervisors
Mayor's Transportation Council

Gentlemen:

Submitted herewith is "A Plan for Rapid Transit in San Francisco Consonant with the Bay Area Rapid Transit System" which has been prepared under the direction of the Transportation Technical Committee of the Mayor's Transportation Council in accordance with a motion adopted by the Board of Supervisors on April 13, 1959, File No. 12476. The work was financed by funds provided in the amount of \$125,000 by Resolution No. 263-59. A copy of each document appears in the appendix.

The report has been prepared by the Utilities Engineering Bureau under the direct supervision of its Chief Engineer with assistance from the staffs of the Department of City Planning, Municipal Railway, Department of Public Works, and the Parking Authority. The work of the Committee was supplemented by consultation with De Leuw, Cather and Company, which firm also furnished technical services of its personnel skilled in this specialized field.

The Committee acknowledges the cooperation and assistance of the staff members of the Bay Area Rapid Transit District.


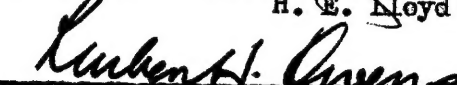
The basic purpose of the study was to determine and plan for the optimum rapid transit service within San Francisco that would be consistent with the overall requirements of a regional system and to provide such service in accordance with standards which will preserve property and aesthetic values within the City.

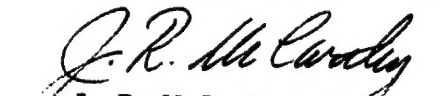
We believe that the recommendations of this report meet this objective, and it is accordingly submitted for your consideration.


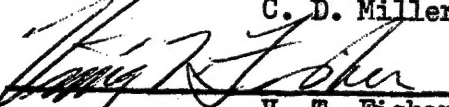
Respectfully submitted,

Approved:

THE TRANSPORTATION TECHNICAL COMMITTEE


H. E. Lloyd

R. H. Owens


J. R. McCarthy, Chairman


C. D. Miller

V. T. Fisher

DESCRIPTION OF INDIVIDUAL ROUTES

Twin Peaks Route

A subway through the existing Twin Peaks tunnel and extending under Market Street toward the Ferry Building has been proposed in practically all of the many plans which have been considered over the years for solution of the mass transportation problem in San Francisco.

No basic changes have occurred, since the last of such plans, which would materially affect the pattern of transit desire lines within the City. The most recent studies indicate that such a Twin Peaks rapid transit line would carry about one and one-half times the number of riders to the central business district each day as would enter the City on the combined Peninsula and Marin lines. The solution of the problem here under study is the rapid movement of people to and from areas of residential, commercial and industrial concentration. The Peninsula, Marin and Transbay lines provide such service from their outlying areas to downtown San Francisco. The Twin Peaks line would similarly move the people from within San Francisco and northwest San Mateo County to the downtown area. For this reason such a line is considered to be essential for inclusion in the first stage of construction.

This line, shown on plan and profile on Plates 4, 5, 6 and 7, would start from a surface terminal station (Plate 16) in Daly City. This station and an associated storage yard and light maintenance shop are located approximately one-quarter mile south of San Francisco County. The line would enter the

City limits at Junipero Serra Boulevard and would there descend into a subway, proceeding northerly under Nineteenth Avenue, St. Francis Circle, West Portal Avenue through the existing Twin Peaks tunnel, under Market to Davis Street and north under Davis to a terminal located in the vicinity of Clay Street in the proposed Golden Gateway redevelopment project.

The bore of the Twin Peaks tunnel (Plate 3) would be enlarged sufficiently to afford proper side clearance for subway cars of the same width - approximately 10 feet 6 inches - as those proposed by the Bay Area Rapid Transit District for use elsewhere on the system. Suitable alterations would be made at Forest Hill Station and at the east and west portals, where connections would be made with new subway structure.

With the exception of two 2-level stations located on Market at Seventh and at First Street, and mentioned further in the description of the Marin-Richmond and the Peninsula lines, the stations between terminals would be of conventional construction. A typical subway station on Market Street is shown on Plate 17 and the two-level station at First and Market is shown on Plate 18. The total number of stations on the Twin Peaks line, including the terminals, would be 14. The line would be eight miles long, so that the average spacing between stations would be 0.62 mile.

Design of the stations on this, as on the other three lines within San Francisco, would be such as to provide a high standard of convenience, accessibility,

and esthetic satisfaction to the passengers using them. At the same time, cost would be held down to the lowest amount consistent with these criteria.

A typical station would have a mezzanine floor accessible from any one of several stairways and escalators from the sidewalk level. The mezzanine, brightly lighted and attractively finished, would have space available for lease to vendors of newspapers and magazines. It would also serve as a convenient and safe way for pedestrians to cross underground from one side of the street to the other. Where practicable in the downtown area, the mezzanine would open directly into one or more adjacent stores or office buildings. Passengers would move between the mezzanine and the train platforms either by stairways or by escalators. The platforms would be approximately 550 feet long for the accommodation of eight-car trains.

Stations served by heavily patronized surface feeder lines would be provided with rapid and convenient bus-to-train interchange facilities. Incoming buses would stop at the near end of a street level bus platform suitably designed to prevent pedestrians from entering the bus parking area. Inbound passengers would be discharged onto the platform, from which they would descend to the subway platform. The bus would then move to the far end of the bus platform, where it would load outbound passengers coming up from the train platforms.

The estimated cost of the Twin Peaks line is tabulated below:

COST OF TWIN PEAKS
RAPID TRANSIT LINE
(in millions)

County line to Golden Gateway terminal	\$ 93
Widening Twin Peaks tunnel	<u>11</u>
Subtotal - Cost within San Francisco	\$ 104
Construction of Way and Shops in San Mateo County	<u>7</u>
Total Cost of Twin Peaks line	\$ 111 *

*No Rolling Stock Included

Marin-Richmond Route

Provision must be made for the daily movement, to and from the central business district of San Francisco, of 30,000 passenger-trips expected to cross the Golden Gate Bridge in 1969, as well as 66,000 passenger-trips in and out of the Richmond district.

At present the means by which the Marin commuters will cross the Golden Gate Bridge has not been resolved by the San Francisco Bay Area Rapid Transit District. In any event, the Committee recommends that the Marin-Richmond line extend to the downtown area from a point at least as far out as the vicinity of Park Presidio Boulevard and Geary Street.

This line, shown in plan and profile on Plates 8 and 9, would continue eastward in subway under Geary Street from the outer terminal to Presidio Avenue, cross over to Post Street at Baker, under Post Street to Leavenworth Street, where it would join the Peninsula line and then

continue under Post Street to Market Street, and easterly under Market Street, in the lower level of a two level subway to a junction with the proposed transbay tube.

In addition to the Park-Presidio terminal, subway stations would be located at appropriate points along the route as shown in Plate 1. There would be eight stations on this four-mile line, including the outer terminal, and the distance between stations would average 0.56 miles, about the same as on the Twin Peaks route. Platform lengths would be 700 feet, to accommodate the ten-car trains planned by the District.

The station at First and Market Streets would serve as an interchange for passengers of the proposed Twin Peaks and future Mission routes on Market Street as shown on Plate 18. Escalators as well as stairways would be provided between the upper and lower train platforms and between each platform and the mezzanine for the convenience of passengers.

Provision of additional tracks a short distance east of the lower level platform would permit those trains not required for service to the East Bay to turn back. Ramp tracks between the upper and lower level tracks would be provided also in this same general location. These would make possible the interchange of trains between routes, and would be particularly useful for transferring cars from the Peninsula or Marin-Richmond lines to the Daly City Shops for maintenance and light repairs, and for the movement of equipment from the Twin Peaks line to either of the other two lines to provide extra service for special events.

The estimated cost of this line is given below:

COST OF MARIN-RICHMOND
RAPID TRANSIT LINE
IN SAN FRANCISCO
(in millions)

Park-Presidio terminal to Post and Leavenworth	\$60
Post and Leavenworth to Davis and Market Streets	<u>9 (a)</u>
Total	\$69 *

Note (a): This portion of the line would be used jointly with the Peninsula route; one-half of the total cost of \$18 million is allocated to each.

* Exclusive of Rolling Stock

Peninsula Route

The shortest and most direct transit route into San Francisco from the south Peninsula communities is over the existing main line right-of-way of the Southern Pacific Company, shown on Plates 12, 13, 14, and 15.

The practicability of adding an additional track, widening or constructing additional tunnels, providing necessary switches and cross overs, effecting grade separation, and equipping this line with a modern train control system has been studied and found to be both feasible and economical. More extensive studies and preliminary discussions with the engineering and management divisions of the Southern Pacific Company have confirmed the initial finding as to the feasibility and the potential economic advantage of this plan.

Under this plan the commuter service of the railway would be absorbed by the proposed Bay Area rapid transit system. Multiple unit, high-speed, electric trains would be operated on two tracks under Centralized Train Control (CTC). The third track, and a system of passing sidings, would be used by the six daily Southern Pacific passenger trains to and from Los Angeles and Monterey, and by freight trains in both directions. The tracks would be grade separated from crossing streets and highways, starting from the terminal south of Palo Alto.

It is the belief of the Committee that under CTC, the combined traffic of the BARTD and the Southern Pacific systems could be handled without mutual interference or delays. However, in the event that further study should indicate the desirability of grade separating the two systems at points where the Southern Pacific serves industries on the west side of the tracks, it has been determined that such separations are entirely practical and could be carried out for something less than \$6 million total.

North of the San Francisco county line the route would occupy a part of the Southern Pacific Right of Way to the vicinity of Seventh and Hooper Streets, where the two tracks allocated to rapid transit would enter a subway section and follow under Seventh and Leavenworth Streets to Post Street. Here the Peninsula line would join that of the proposed Marin-Richmond route and continue eastward under Post Street to Market and under Market Street to the transbay tube.

The two stations in San Francisco along that part of the right-of-way used jointly with the Southern Pacific Company would be located in the vicinity of Visitacion Avenue and Oakdale Avenue and would be surface structures.

Subway stations would be located at or near Seventh and Bryant, Seventh and Market, Post at Powell, Post and Kearny, and Market and First Streets. Of these five sub-surface structures two deserve special mention. The station at Seventh and Market Streets would connect with the proposed rapid transit lines under Market Street, which would cross over some 20 feet above the Peninsula line. Escalators would be provided between the upper and lower platforms of this subway station for convenient transfer of passengers between the two lines. The two-level station at First and Market Streets, which would be of similar functional design, has been described in the section on the Marin-Richmond route.

The cost of constructing and installing the facilities necessary to adapt the Southern Pacific right-of-way and existing trackage to rapid transit services would be materially less than the cost of constructing the alternate proposed line into San Francisco from San Bruno to Daly City, thence via a Mission route to Market and eastward under Market to the Transbay tube. The comparative costs, tabulated below, indicate that a saving of some \$43 million could be effected by adoption of the recommended route. In addition, it is possible that the municipalities affected and the state may contribute substantially to the expense of grade separation, the cost of which has been included in the table. Thus the saving in capital outlay required by the District could be in excess of \$43 million.

COMPARATIVE COSTS OF
PENINSULA RAPID TRANSIT WAY FACILITIES
INTO SAN FRANCISCO FROM
SAN BRUNO TO DAVIS AND MARKET STREETS
(in millions)

	(1) <u>Mission Route</u>	(2) <u>S. P. Route</u>
San Bruno to San Francisco County line	\$ 25	\$12
San Francisco County line to Davis and Market Streets	105 (a)	
San Francisco County line to Seventh and Hooper Streets		<u>37 (b)</u>
Subtotal		\$49
Seventh and Hooper to Post and Leavenworth Streets		29
Post and Leavenworth to Davis and Market Streets	<u> </u>	<u>9 (c)</u>
Total	\$130 *	\$87 *

Note (a): Includes 7 stations between the County line and Market Street located at Sickles Avenue, Ocean Avenue, Bosworth Street, Cortland Avenue, 24th, 20th, and 16th Streets.

Note (b): Includes 3 stations between the County line and Market Street located at Visitation Avenue, Oakdale Avenue, and Bryant Street.

Note (c): This portion of the line would be used jointly with the Marin-Richmond route; one-half of the total cost of \$18 million is allocated to each.

* Exclusive of Rolling Stock

Mission Route

In the section "Estimates of Future Rapid Transit Patronage" mention was made of a Mission route, which had been studied independently, and it was noted that such an alternate Mission line would cost some \$4 million more to build and would serve only 70 per cent as many transit riders as the Twin Peaks line, assuming both from the same point of origin. These considerations and recognition of the probable need of postponing capital expenditure for one or the other of these lines to a later stage, led to the decision to recommend that construction of the Mission line be deferred to Stage 2 of the area-wide development of the system.

Although such postponement is considered to be prudent, this conclusion is not to be interpreted as a reflection on the importance of or the need for this addition to the system. Indeed, the Committee recommends that the Mission line be programmed for construction at the earliest possible date following completion of the Stage 1 construction.

The line as recommended, shown in plan and profile on Plates 10 and 11, would start from a terminal at Ocean Avenue and the proposed Southern Freeway. The tracks would be located in the center mall of the Freeway from Ocean Avenue to the vicinity of Hearst Avenue where the line would enter a subway section and would continue under Chenery and Mission Streets to Market. Here the two-track tube would separate into two single-track tubes. The inbound tube would turn east and join the Market Street tube of the Twin Peaks line. The Mission route from this point would share the tracks under Market Street jointly with the Twin Peaks route,

terminating in the Golden Gateway station at Davis and Clay Streets. The outbound track on Market Street would switch westerly for a short distance, then turn southerly under the Market Street subway and rise to join the two-track section under Mission Street.

Assuming an initial terminal at Ocean Avenue, six stations would be provided on that part of the line which lies south of Market Street or a total of 12 stations, including those on Market Street and the Golden Gateway terminal, with an average spacing of approximately 0.56 mile.

At the scheduled time for construction of the Mission line the subway under Market Street would have been completed as a part of the Twin Peaks route, and stub lines constructed for later connection to the Mission line. The additional construction for the Mission line would therefore be confined to that portion of the route between Ocean Avenue and Market Street. The incremental cost of this work is estimated at \$67 million.

Provision for the costs which would be necessary to secure ultimate use of about a mile of the center mall of the Southern Freeway to Ocean Avenue, as part of the right-of-way, would have to be made immediately; this is estimated at \$2 million. The remaining \$65 million would not be required until Stage 2 of the construction program.

TABLE 2
TWIN PEAKS ROUTE
DISTANCES & RUNNING TIMES

<u>Station</u>	<u>Distance (Miles)</u>		<u>Time (minutes and seconds)</u>		
	<u>Between Stations</u>	<u>From First Station</u>	<u>Between Stations</u>	<u>Station Stop</u>	<u>From First Station</u>
Daly City		-		-	-
	1.28		1'-47"		
Park Merced		1.28		20"	1'-47"
	0.34		49"		
Stonestown		1.62		20"	2'-56"
	0.60		1'-07"		
St. Francis		2.22		20"	4'-23"
	0.51		1'-01"		
West Portal		2.73		20"	5'-44"
	0.58		1'-06"		
Forest Hill		3.31		20"	7'-10"
	1.79		2'-14"		
Castro		5.10		20"	9'-44"
	0.46		57"		
Church		5.56		20"	11'-01"
	0.71		1'-14"		
Civic Center		6.27		30"	12'-35"
	0.43		56"		
Seventh Street		6.70		30"	14'-01"
	0.33		48"		
Fifth Street		7.03		30"	15'-19"
	0.32		47"		
Third Street		7.35		30"	16'-36"
	0.32		47"		
First Street		7.67		30"	17'-53"
	0.35		50"		
Golden Gateway		8.02		-	19'-13"

Average Over-all Speed: 25.0 mph
Average Distance Between Stations: 0.62 miles

TABLE 3
MARIN-RICHMOND ROUTE
DISTANCES & RUNNING TIMES

<u>Station</u>	<u>Distance (Miles)</u>		<u>Time (minutes and seconds)</u>		
	<u>Between Stations</u>	<u>From First Station</u>	<u>Between Stations</u>	<u>Station Stop</u>	<u>From First Station</u>
Park Presidio		--		---	---
Arguello	0.65		1'-10"		
Masonic	0.55	0.65	20"		1'-10"
Fillmore	0.87	1.20	20"		2'-33"
Van Ness	0.62	2.07	20"		4'-17"
Powell	0.71	2.69	1'-08"		
Kearny	0.27	3.40	30"		5'-45"
First Street	0.28	3.67	44"		7'-29"
		3.95	30"		8'-43"
			45"		9'-58"

Average Over-all Speed: 23.8 mph

Average Distance Between Stations: 0.56 miles

TABLE 4
MISSION ROUTE
DISTANCES & RUNNING TIMES

<u>Station</u>	<u>Distance (Miles)</u>		<u>Time (minutes and seconds)</u>		
	<u>Between Stations</u>	<u>From First Station</u>	<u>Between Stations</u>	<u>Station Stop</u>	<u>From First Station</u>
Ocean		-		-	-
	1.09		1'-37"		
Bosworth		1.09		20"	1'-37"
	0.83		1'-22"		
30th Street		1.92		20"	3'-19"
	0.78		1'-18"		
24th Street		2.70		20"	4'-57"
	0.44		56"		
20th Street		3.14		20"	6'-13"
	0.42		55"		
16th Street		3.56		20"	7'-28"
	0.81		1'-21"		
Civic Center		4.37		30"	9'-09"
	0.43		56"		
Seventh Street		4.80		30"	10'-35"
	0.33		48"		
Fifth Street		5.13		30"	11'-53"
	0.32		47"		
Third Street		5.45		30"	13'-10"
	0.32		47"		
First Street		5.77		30"	14'-27"
	0.35		50"		
Golden Gateway		6.12		-	15'-47"

Average Over-all Speed: 23.2 mph
Average Distance Between Stations 0.56 miles

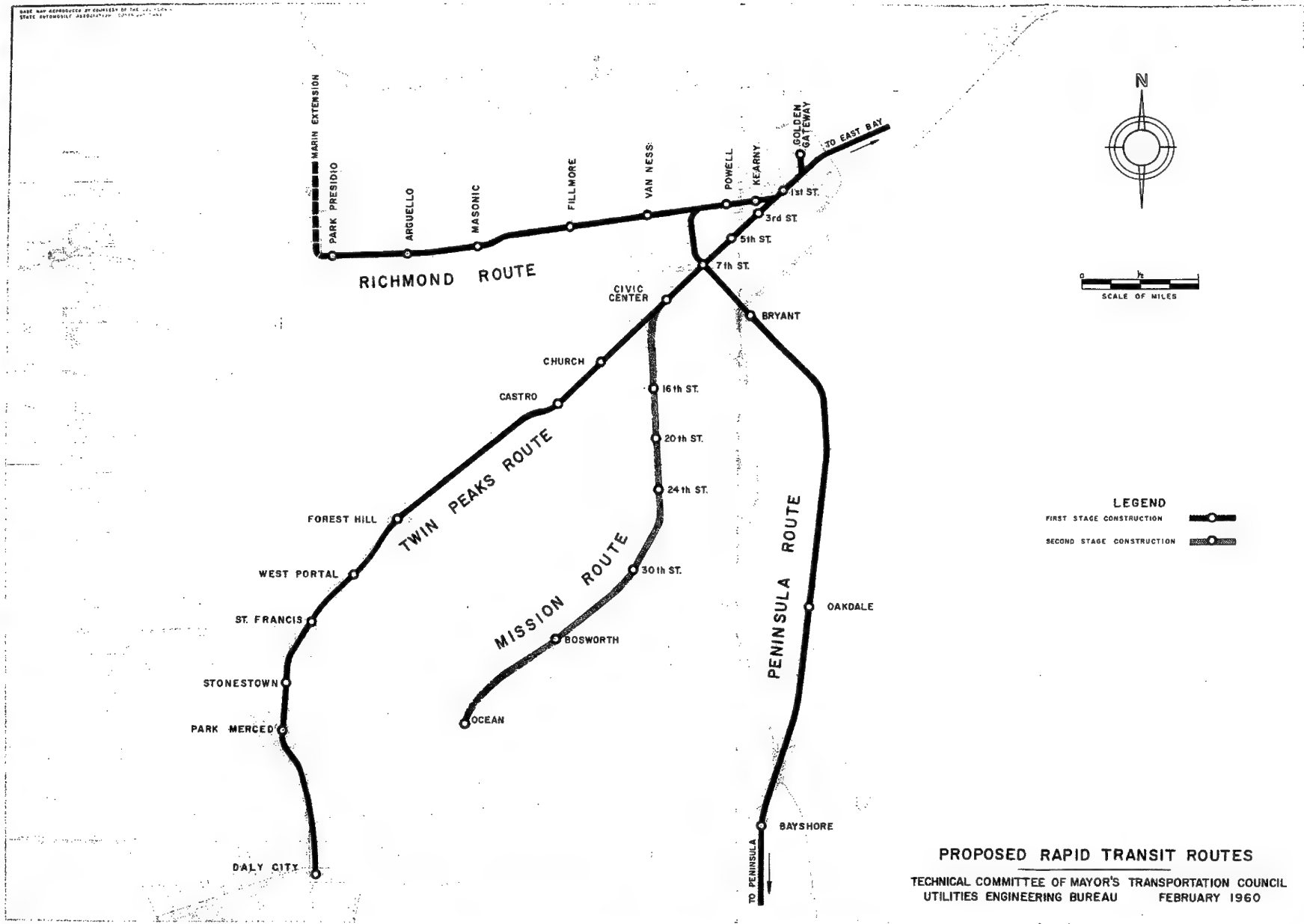
TABLE 5
PENINSULA LINE
DISTANCES & RUNNING TIMES IN SAN FRANCISCO

<u>Station</u>	<u>Distance (Miles)</u>		<u>Time (minutes and seconds)</u>		
	<u>Between Stations</u>	<u>From First Station</u>	<u>Between Stations</u>	<u>Station Stop</u>	<u>From First Station</u>
Bayshore		--		--	--
	1.87		2 ^t -18"		
Oakdale		1.87		20"	2 ^t -18"
	2.73		3 ^t -02"		
Bryant		4.60		20"	5 ^t -40"
	0.59		1 ^t -06"		
Seventh Street		5.19		30"	7 ^t -06"
	0.76		1 ^t -17"		
Powell		5.95		30"	8 ^t -53"
	0.27		44"		
Kearny		6.22		30"	10 ^t -07"
	0.28		45"		
First Street		6.50		--	11 ^t -22"

Average Over-all Speed: 37.5 mph

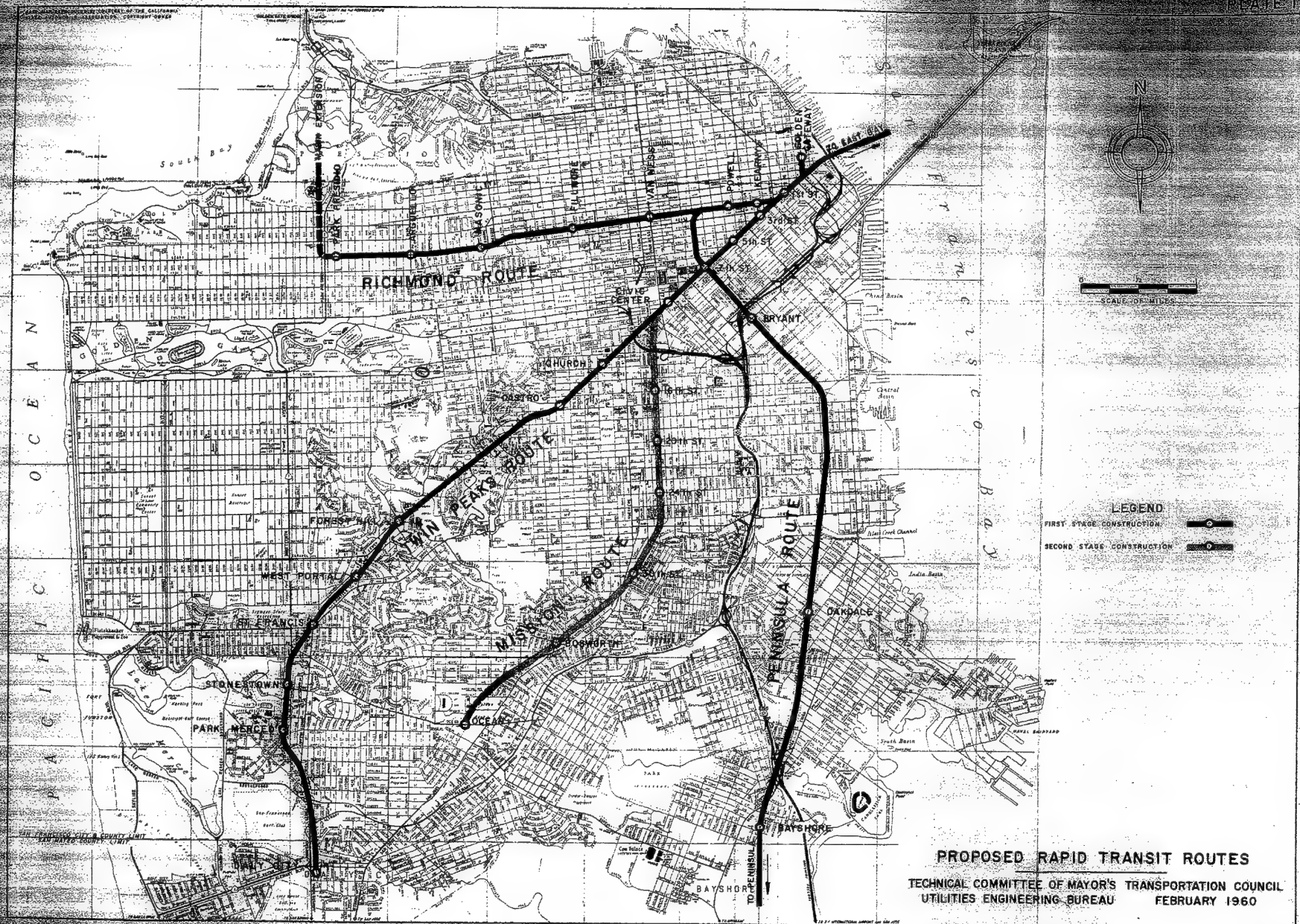
Average Distance Between Stations: 1.08 miles

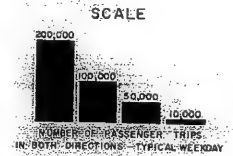
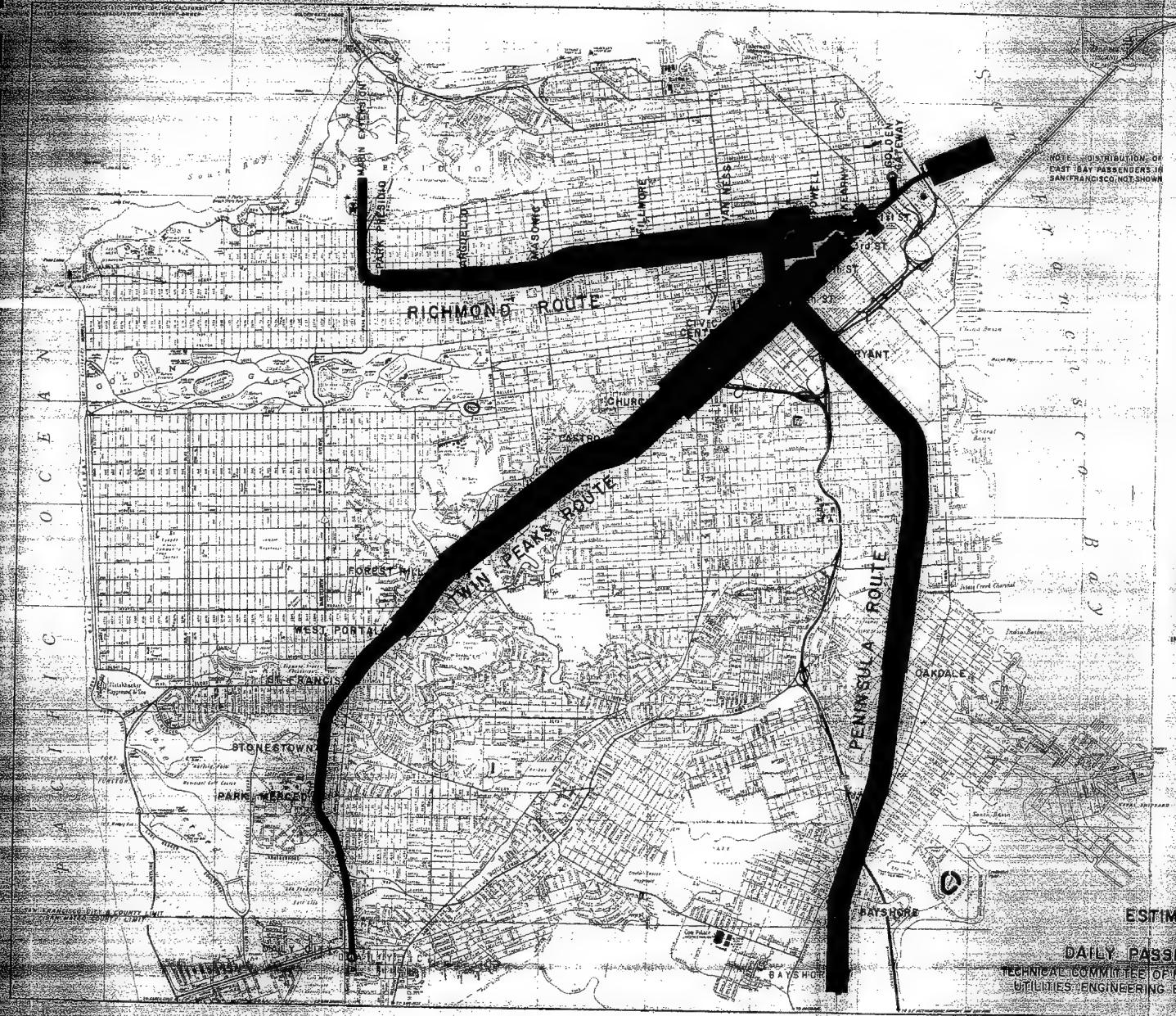
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STATE AUTOMOBILE ASSOCIATION (SAA) 1960



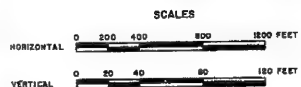
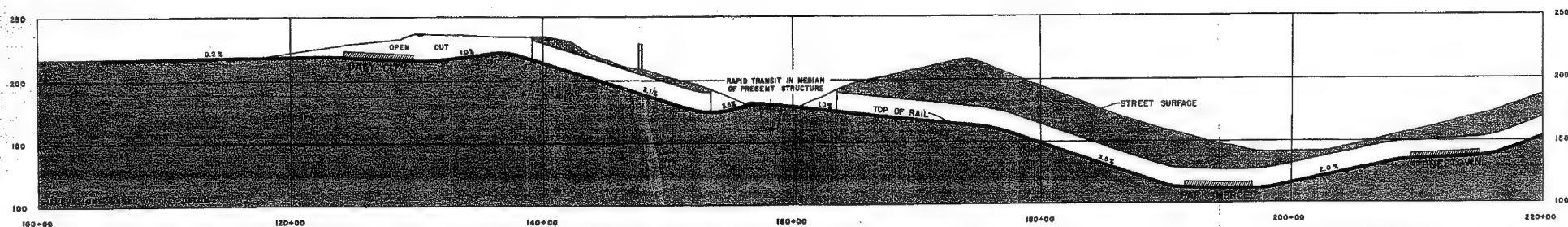
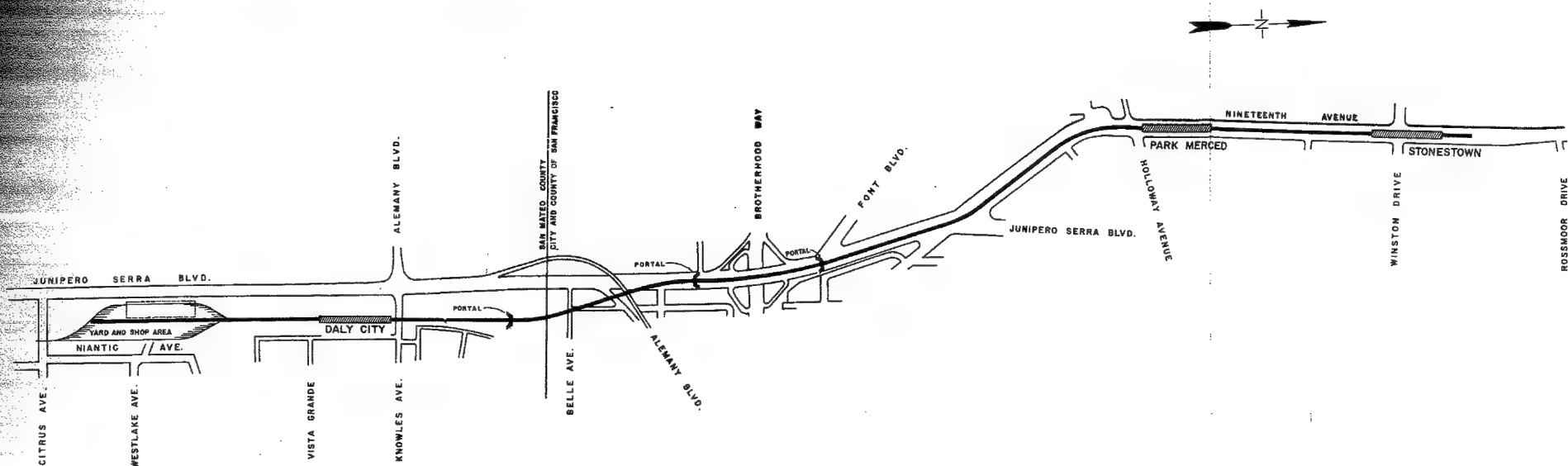
PROPOSED RAPID TRANSIT ROUTES

TECHNICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL
UTILITIES ENGINEERING BUREAU FEBRUARY 1960



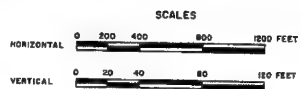
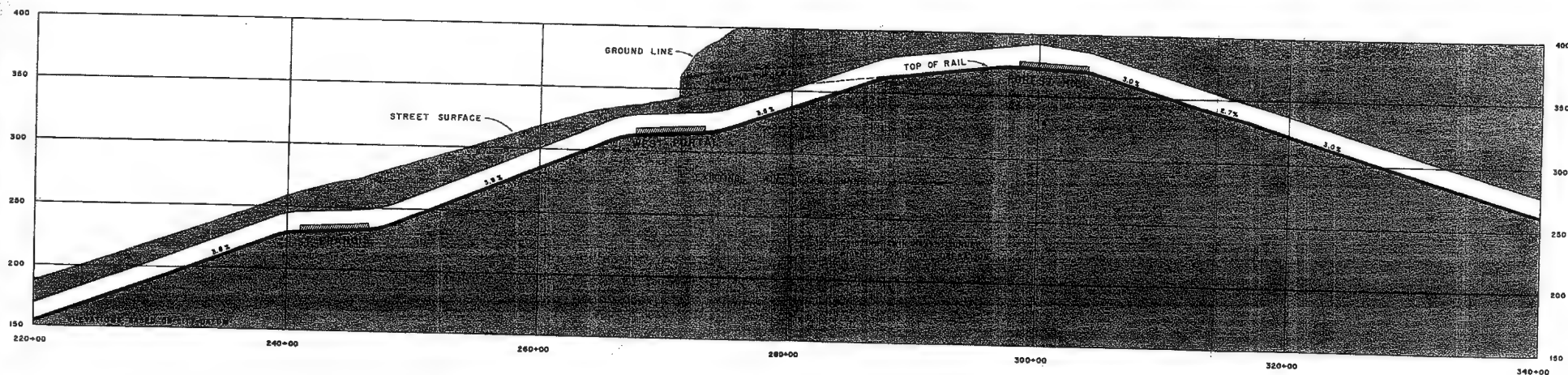
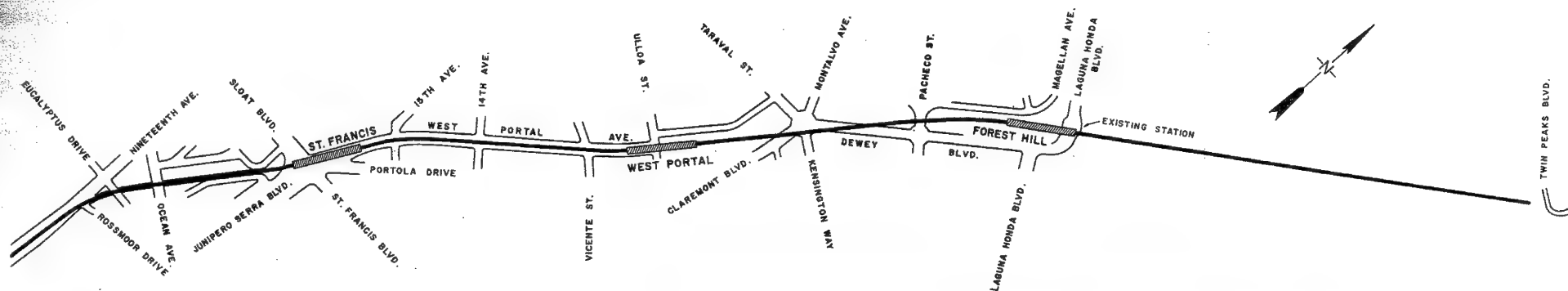


ESTIMATED NUMBER
OF
DAILY PASSENGER TRIPS -- 1969
TECHNICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL
UTILITIES ENGINEERING BUREAU FEBRUARY 1960

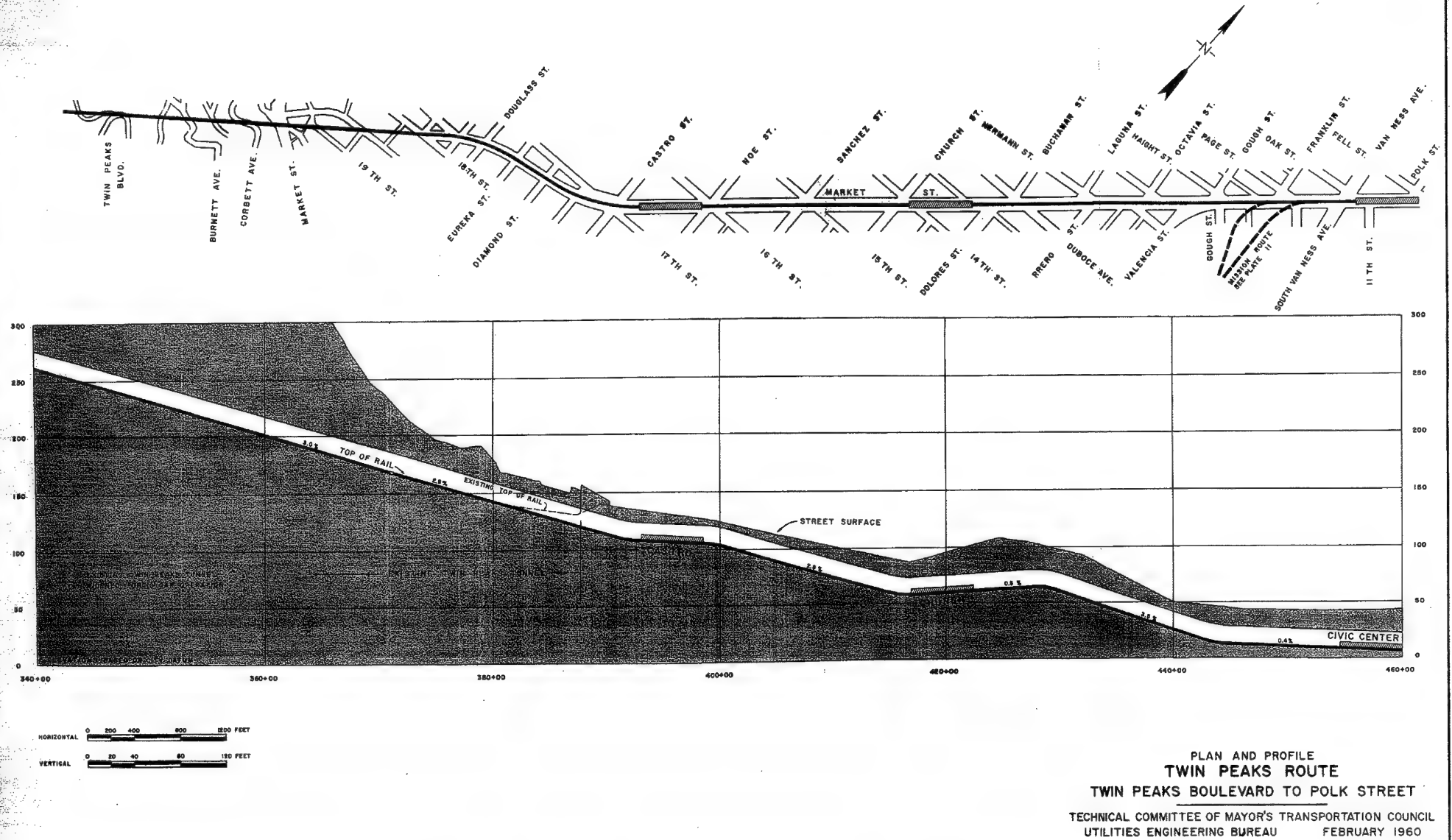


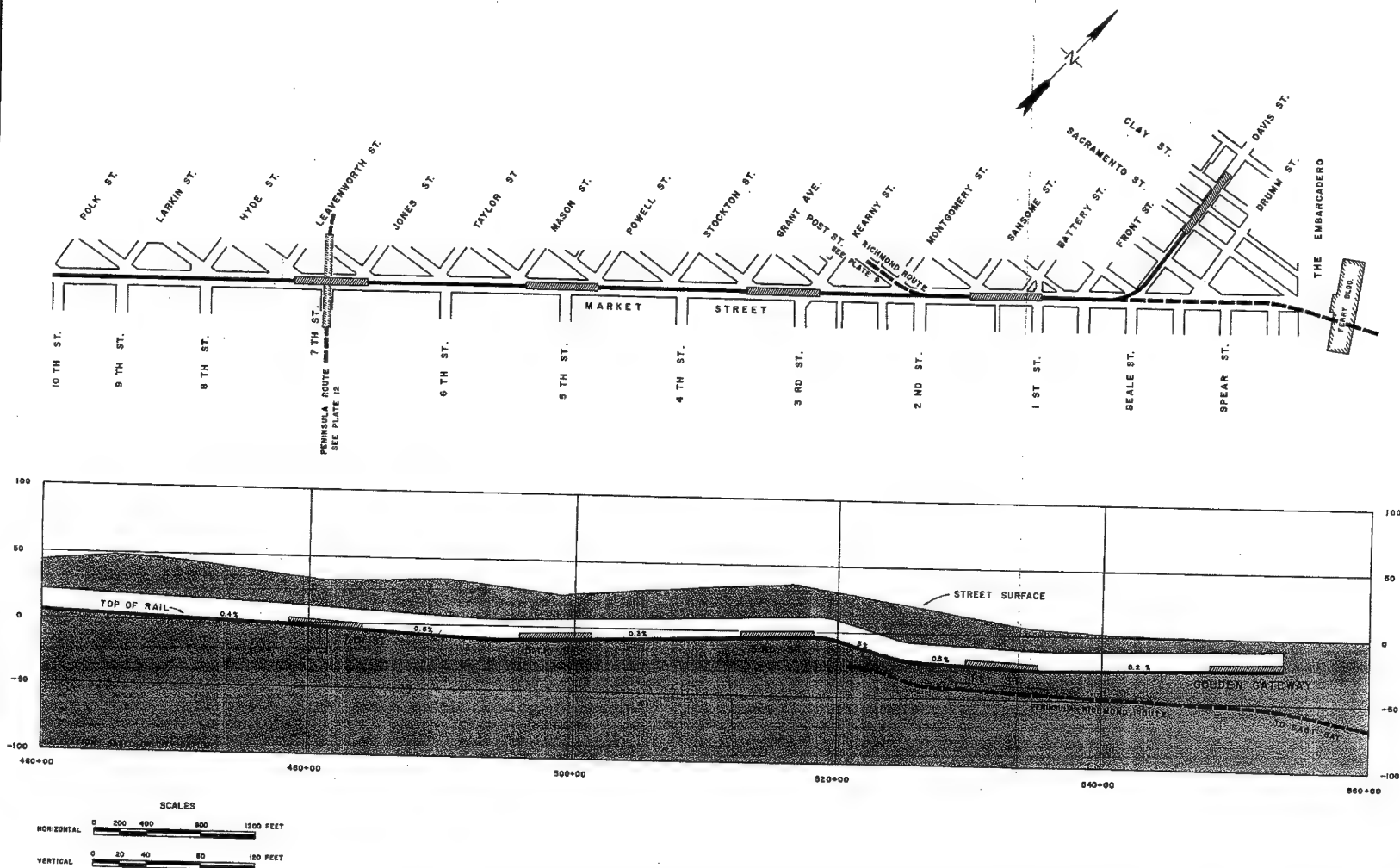
PLAN AND PROFILE
TWIN PEAKS ROUTE
DALY CITY TO ROSSMOOR DRIVE

TECHNICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL
UTILITIES ENGINEERING BUREAU FEBRUARY 1960

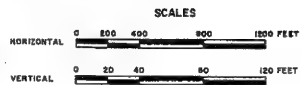
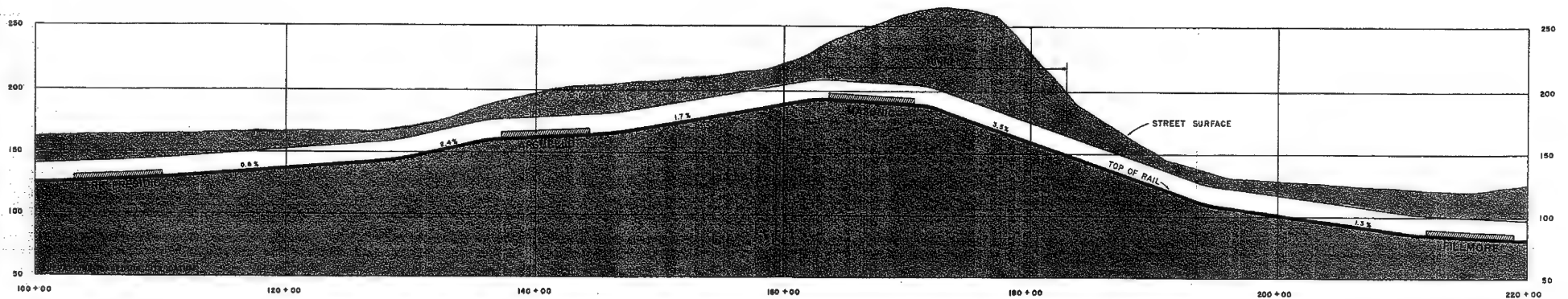
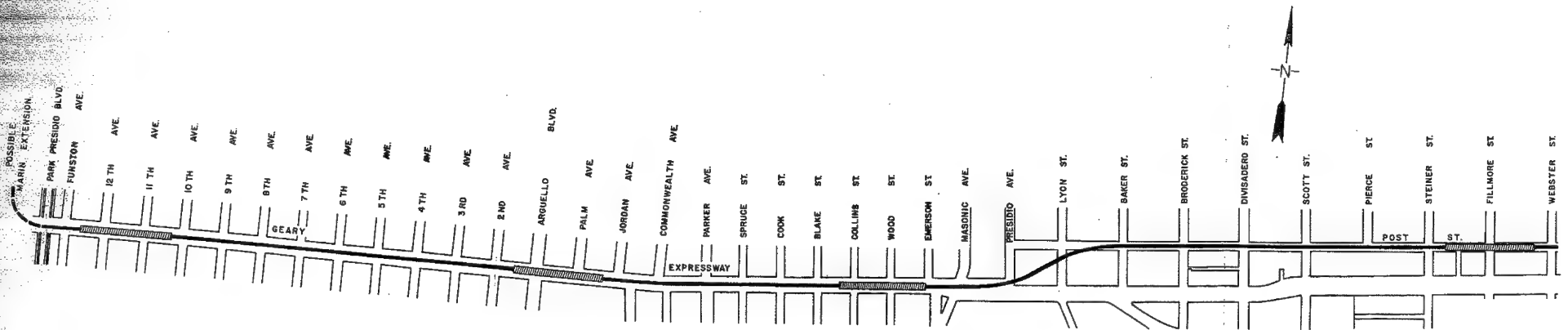


PLAN AND PROFILE
TWIN PEAKS ROUTE
ROSSMOOR DRIVE TO TWIN PEAKS BOULEVARD
TECHNICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL
UTILITIES ENGINEERING BUREAU
FEBRUARY 1960

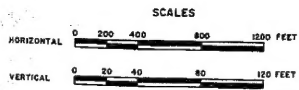
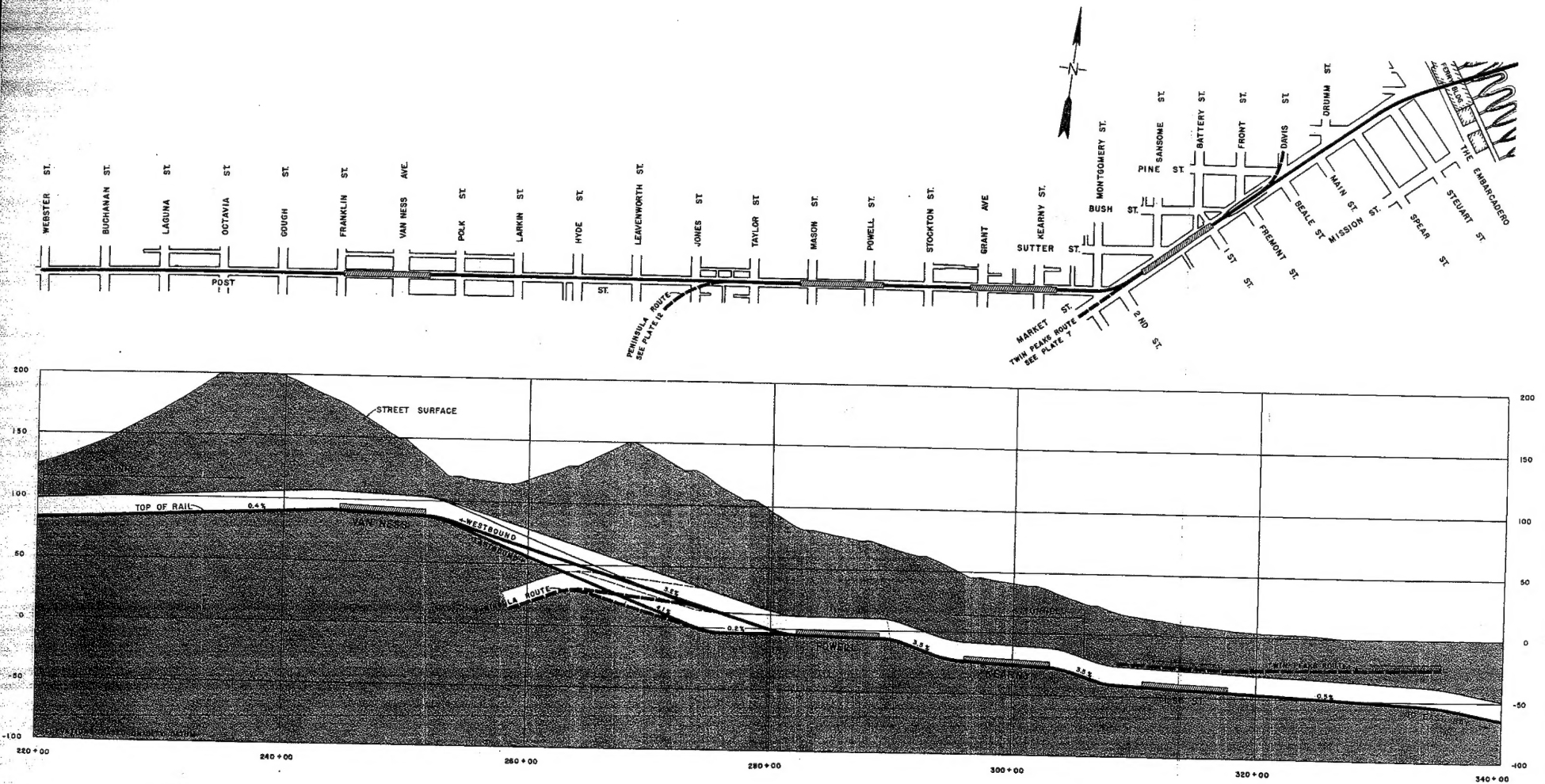




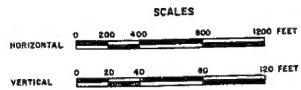
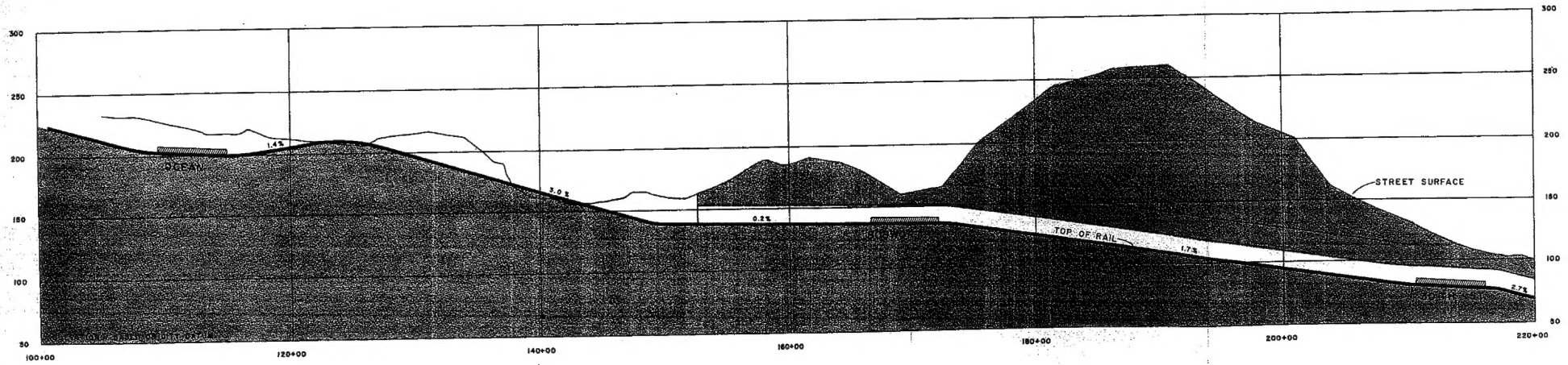
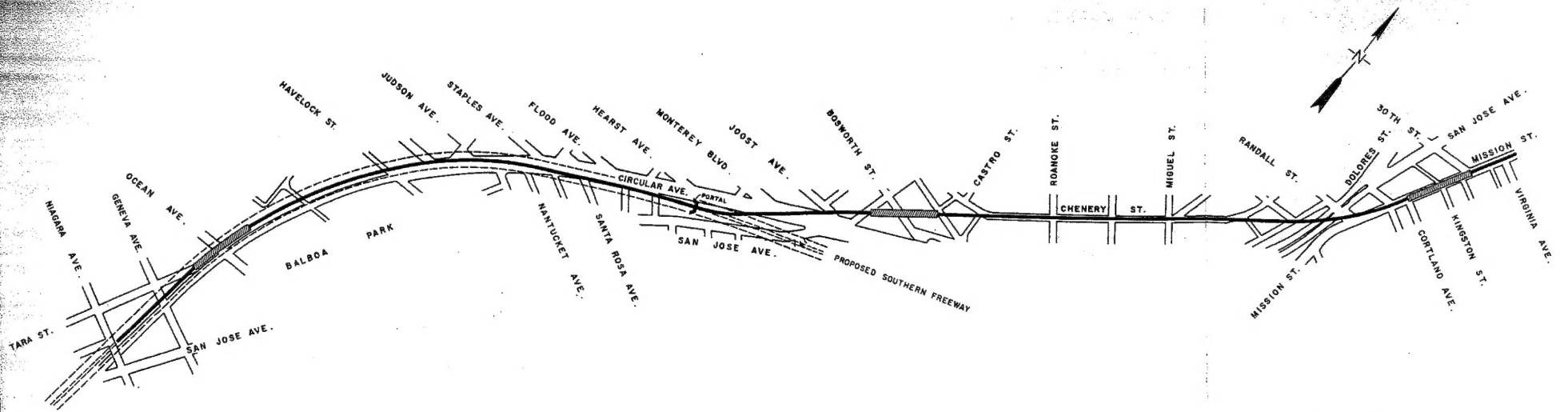
PLAN AND PROFILE
TWIN PEAKS ROUTE
POLK STREET TO DAVIS AND CLAY STREETS
TECHNICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL
UTILITIES ENGINEERING BUREAU FEBRUARY 1960



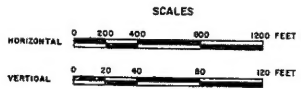
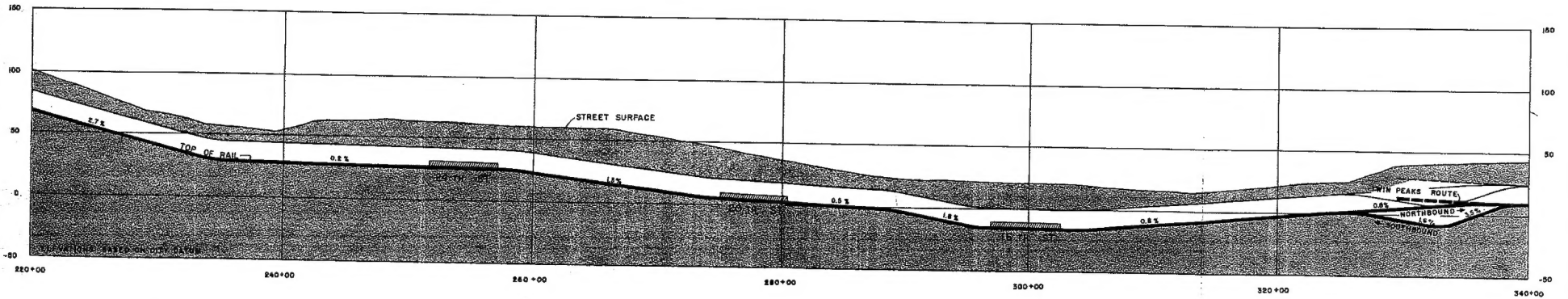
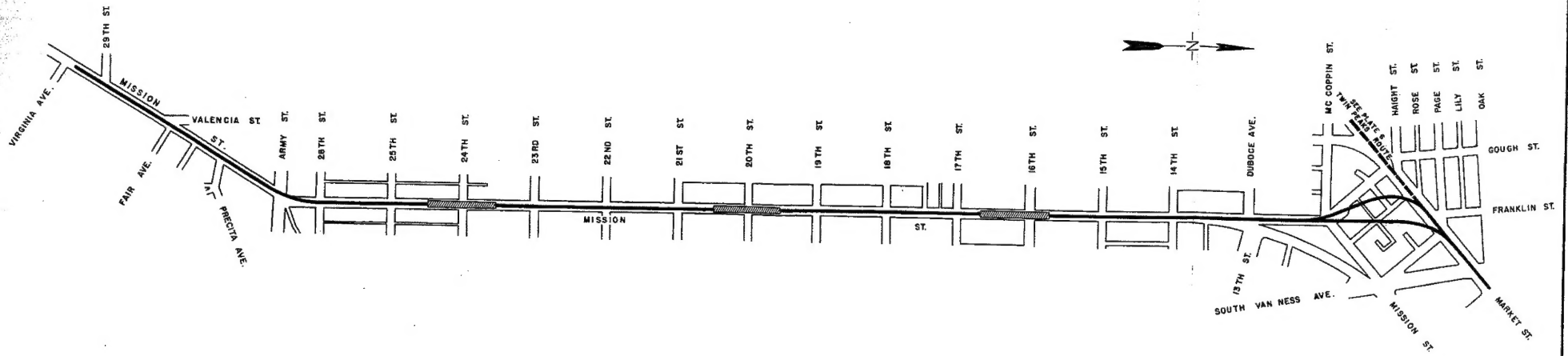
PLAN AND PROFILE
 RICHMOND ROUTE
 PARK PRESIDIO BOULEVARD TO WEBSTER STREET
 TECHNICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL
 UTILITIES ENGINEERING BUREAU FEBRUARY 1960



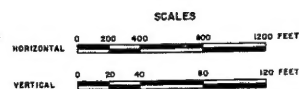
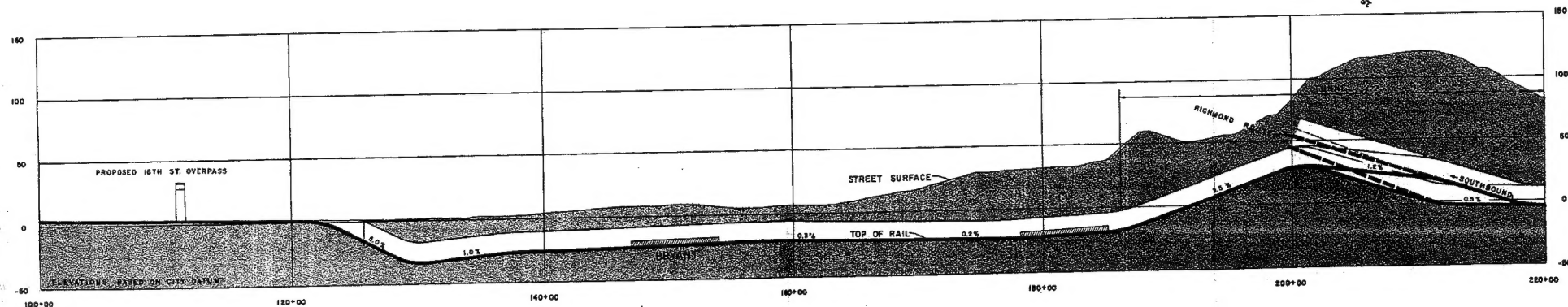
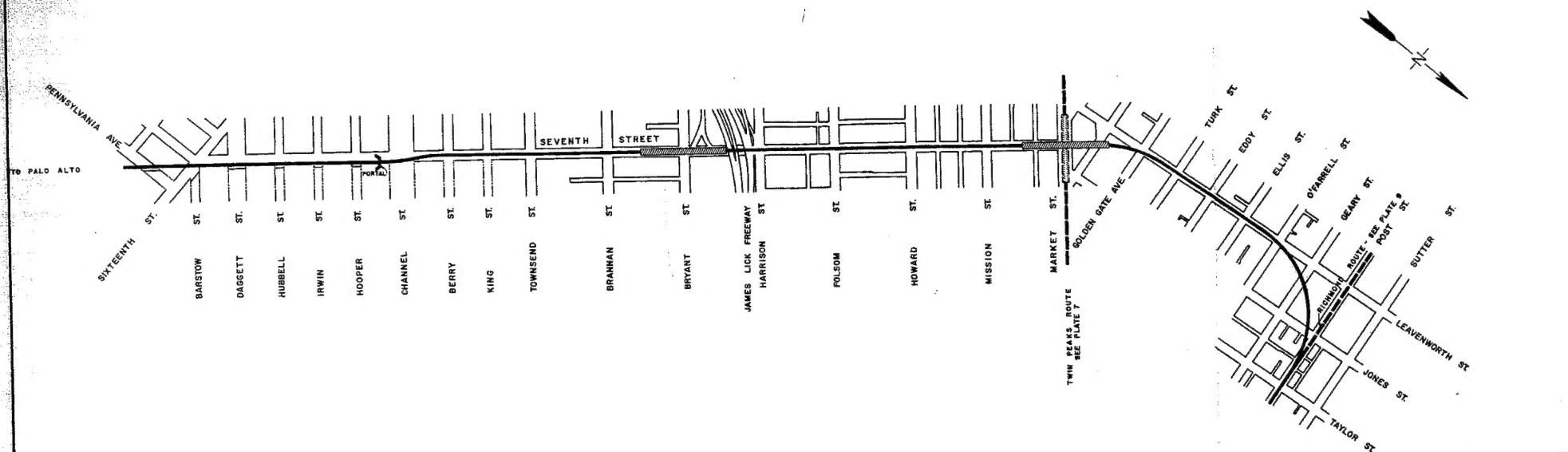
PLAN AND PROFILE
 RICHMOND ROUTE
 WEBSTER STREET TO FIRST AND MARKET STREETS
 TECHNICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL
 UTILITIES ENGINEERING BUREAU FEBRUARY 1960



PLAN AND PROFILE
MISSION ROUTE
 OCEAN AVENUE TO VIRGINIA AVENUE
 TECHNICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL
 UTILITIES ENGINEERING BUREAU FEBRUARY 1960



PLAN AND PROFILE
MISSION ROUTE
 VIRGINIA AVENUE TO MARKET STREET
 TECHNICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL
 UTILITIES ENGINEERING BUREAU FEBRUARY 1960



PLAN AND PROFILE
PENINSULA ROUTE
 PENNSYLVANIA AVENUE TO POST STREET
 TECHNICAL COMMITTEE OF MAYOR'S TRANSPORTATION COUNCIL
 UTILITIES ENGINEERING BUREAU FEBRUARY 1960